

Acronym: Integrated Immune-SDBI

Title: Validation of Procedures for Monitoring Crewmember Immune Function - Short Duration Biological Investigation

Principal Investigator(s):

Clarence Sams, Ph.D, Johnson Space Center, Houston, TX

Co-Investigator(s)\Collaborator(s):

Brian Crucian, Ph.D., Wyle Laboratories, Houston, TX
Raymond Stowe, Ph.D., Microgen Labs, La Marque, TX
Duane Pierson, Ph.D., Johnson Space Center, Houston, TX
Satish Mehta, Ph.D., Enterprise Advisory Services, Incorporated, Houston, TX
Boris Morukov, M.D., Ph.D., Institute for Biomedical Problems, Moscow, Russia
Peter Uchakin, Ph.D. Mercer University School of Medicine, Macon GA
Sandra Nehlsen-Cannarella, Ph.D., Loma Linda University Medical Center, Loma Linda, CA

Contact(s):

PI - [Clarence Sams](#), (281) 483-7160

Mailing Address(es):

Dr. Clarence Sams
Johnson Space Center
National Aeronautics and Space Administration
2101 NASA Parkway
Mail Code: SK37
Building 37, Room 162
Houston, TX 77058

Developer(s): Johnson Space Center, Human Research Program, Houston, TX

Sponsoring Agency: National Aeronautics and Space Administration (NASA)

Increment(s) Assigned: 16, 17, 18, 19, 20

Mission(s): STS-120/10A, STS-122/1E, STS-123/1JA; STS-124/1J; STS-126/ULF2; STS-125/HST; STS-125/HST, STS-127/2J/A; STS-128/17A

Brief Research Summary (PAO): Validation of Procedures for Monitoring Crew Member Immune Function - Short Duration Biological Investigation (Integrated Immune-SDBI) will assess the clinical risks resulting from the adverse effects of space flight on the human immune system and will validate a flight-compatible immune monitoring strategy. Immune system changes will be monitored by collecting and analyzing blood, urine and saliva samples from crewmembers before, during and after space flight.

Research Summary:

- There is ample postflight evidence to suggest that spaceflight has a negative effect on the immune system however, little inflight data has been collected. The inflight data that exists suggests immune dysregulation occurs during flight. There are several possible causes ranging from microgravity to stress to radiation. Complications arising from an immune system dysregulation have the potential to pose a clinical risk for exploration class space missions.
- In order to develop a countermeasures to reduce in-flight immune dysfunction, a monitoring strategy must be developed.

- The objective of this study is to validate a monitoring strategy that will allow future countermeasures to be developed.

Detailed Research Description: The Validation of Procedures for Monitoring Crewmember Immune Function - Short Duration Biological Investigation (Integrated Immune-SDBI) is to develop and validate an immune monitoring strategy consistent with operational flight requirements and constraints. There are no procedures currently in place to monitor immune function or its influence on crew health. Immune dysregulation has been demonstrated to occur during spaceflight, yet precious little inflight immune data has been generated to assess this clinical problem. Integrated Immune-SDBI assesses the clinical risks resulting from the adverse effects of space flight on the human immune system and will validate a flight-compatible immune monitoring strategy. Characterization of the clinical risk and the development of a monitoring strategy are necessary prerequisite activities prior to validating countermeasures.

Preflight, inflight and postflight assessments will be performed. The inflight samples will allow a distinction between legitimate inflight alterations and the physiological stresses of landing which are believed to alter landing day assessments. The overall status of the immune system during flight (activation, deficiency, dysregulation) and the response of the immune system to specific latent virus reactivation (known to occur during space flight) will be thoroughly assessed.

Following completion of the investigation, the data will be evaluated to determine the optimal set of assays for routine monitoring of crewmember immune system function. It is intended that the determined set of relevant assays will be incorporated into the Clinical Status Evaluation (CSE) and utilized to monitor the effectiveness of human medical countermeasures related to immune function (exercise, medication, diet regulation-supplementation, immune modulators, etc.). In addition, the assays validated here will have significant benefit for the routine monitoring of crewmember's immune system status with regard to diagnosis and prognosis of immune-related disease states.

Project Type: Payload

Images and Captions:



The image above is the kit that contains all the items the crew will need for taking blood samples. Image courtesy of NASA, Johnson Space Center.



Pictured here is the kit that will be used to collect the saliva samples. In the upper left of the image the rolled gauze is seen; this will be placed into the mouth to absorb saliva. Image courtesy of NASA, Johnson Space Center.

Operations Location: Sortie

Brief Research Operations:

- Preflight and postflight activities include collecting blood, urine and saliva samples at designated timepoints.
- Shuttle crewmembers will collect a saliva sample every other day for the duration of their mission with a blood draw occurring on the day before they land.
- All samples are returned to Earth for analysis.

Operational Requirements: Preflight, each subject performs two sessions: one at L-180 (launch minus 180) days and another at L-10 days. Each session consists of four liquid saliva collections (performed every other day), with the blood draw, 24-hour urine and dry book saliva sample collection occurring on the day between the second and third liquid saliva collection.

Postflight, a liquid saliva sample is collected every other day from R+0 (Return plus 0) to R+14 days along with blood and 24-hour urine samples collected on R+0 and R+14 days. Dry book saliva samples are collected on R+1 and R+14 days.

Inflight, only blood and saliva samples are collected for subjects. There is no urine sample requirement for inflight operations. Subjects provide a liquid saliva sample every other day for the duration of the mission such that the final sample is collected on R-1. Also dry book saliva samples are collected on Flight Day 2 and on R-1. One blood sample is collected on R-1 in conjunction with the final liquid saliva sample and second dry book saliva sample.

Operational Protocols: Operations for this experiment consist of three types of sample collections: blood, urine and saliva. There are two types of saliva samples collected. Liquid saliva samples require the subject to soak a piece of cotton with saliva and place the cotton in a salivette bag. Dry book saliva samples are collected on filter paper bound in a small, specialized book at certain time intervals throughout the collection day. For preflight and postflight BDC only, 24-hour urine collections require the subject to collect all urine starting with the first void of the day and continuing for a full 24-hour period.

Review Cycle Status: **PI Reviewed**

Category: Human Research and Countermeasure Development for Exploration

Sub-Category: Immune System

Space Applications: The study will result in the validation of a monitoring strategy that will allow the development of effective countermeasures, which, when implemented, will safeguard the health of the crew during long-duration space missions.

Earth Applications: The data collected during this investigation may lead a greater understanding of how the immune system is affected by different factors from stress to the environment. This data could potentially be used to help develop new treatments and preventative measures for immune dysfunctions.

Manifest Status: Continuing

Supporting Organization: Exploration Systems Mission Directorate (ESMD)

Previous Missions: Increment 16 will be the first mission for Integrated Immune-SDBI.

Web Sites:

[International Space Station Medical Project \(ISSMP\)](#)

Related Payload(s): Epstein-Barr, Integrated Immune

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